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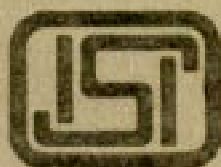
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Indian Standard
CODE OF PRACTICE FOR
FINISHING OF AUTOMOBILE BODIES
PART I FINISHING OF PASSENGER CARS

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CODE OF PRACTICE FOR FINISHING OF AUTOMOBILE BODIES

PART I FINISHING OF PASSENGER CARS

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Indian Standard

CODE OF PRACTICE FOR FINISHING OF AUTOMOBILE BODIES

PART I FINISHING OF PASSENGER CARS

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 15 April 1976, after the draft finalized by the Paints and Allied Products Sectional Committee had been approved by the Chemical Division Council.

0.2 The objective in painting is to obtain desired product appearance consistent with maximum durability. This objective is achieved by proper application of organic fillers, putties, primers and enamels on to surfaces which have been cleaned and/or chemically treated.

0.3 A large number of material specifications on ready mixed paints, enamels, varnishes, lacquers and allied products have created a need for codes of practice for finishing of automobiles bodies, machinery, equipment, etc. The concerned technical committee decided to phase the work and has in the first instance formulated code of practice for finishing of automobile bodies.

0.3.1 Code of practice for other automobile bodies and refinishing would be taken up in due course.

0.4 In the preparation of this standard, substantial assistance has been derived from the information provided by M/s Addisons Paints and Chemicals Ltd, Madras; The Alkali and Chemical Corporation of India Ltd, Calcutta; and The Premier Automobiles Ltd, Bombay which is thankfully acknowledged.

1. SCOPE

1.1 This standard (Part I) prescribes the practices to be followed in finishing (painting) of new passenger cars. It covers surface preparation and finishing of cars using stoving enamels and nitrocellulose lacquers.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 1303-1963*, IS : 6667-1972†, IS : 101-1964‡ and the following shall apply.

*Glossary of terms relating to paints (*revised*).

†Glossary of terms used in synthetic resin industry.

‡Methods of test for ready mixed paints and enamels (*second revision*).

2.1.1 Plenum Chamber — The chamber where filtered air is received for supply to spray booths and other places to make them dust free.

2.1.2 Integral Parts — The parts joined to a car body by welding, brazing, etc.

2.1.3 First Deck — First place in a sequence.

2.1.4 Wet Deck — The place where a car body is sanded with silicon carbide papers using water as medium.

2.1.5 First Enamel Booth — The spray booth where first of the two enamel coats, wet on wet, is applied.

2.1.6 Sand Through — The sanding of the paint film when it reaches the base metal.

3. SURFACE PREPARATION

3.1 Punching and Drilling of Assembly Holes (Body Shop) — All assembly holes for affixing of mouldings, medallions, or any other exterior trim or functional items on the exterior and decorative painted surfaces of the body shall be drilled or punched prior to entry of the body into the paint-shop area.

3.2 Removal of Residual Soldering Flux (Body Shop) — All liquid and solidified zinc chloride soldering flux shall be removed by wet cloth. It is necessary that these operations be performed in the body shop area.

3.3 Removal of Loose Foreign Material (Paint Shop) — Clean the body inside and outside by brushing and blowing off with compressed air. All foreign material shall be removed from the interior and exterior surfaces, joints and crevices. Use wire brushes on joints and crevices, if necessary.

3.4 Preparation of Soldered Areas — The surface provided by solder metal may possess cavities of a re-entrant nature. These cavities may have a small opening at the surface but may enlarge inwardly from the opening. The surface contains pores and to this extent it is porous or pitted. When such a surface has a coating of paint applied, gaseous or liquid substance or other extraneous material is frequently trapped in the cavities. Such materials expand under heat and the internal pressure created raises and ruptures the overlying covering of paint causing a defect referred to as a crater or pit. The object, therefore, of this operation is to fill the cavities with a suitable material thus displacing objectionable gaseous, liquid or solid substances which could expand and rupture the exterior paint coating.

3.5 Clean-Up Prior to Phosphate Coating

3.5.1 Removal of Rust — Remove rust, utilizing rust removing chemicals. Wipe with a rag or sponge and followed by a water rinse.

3.5.2 Removal of Chalk Marks — Removal of chalk marks, either mechanically or with solvents and body-in-white cleaners, is necessary.

3.5.3 Removal of Welding Primer and Zinc Chromate Sealer — Mineral turpentine solvents may be used prior to the clean-up operations to facilitate removal of zinc chromate sealer and zinc dust welding primer. It is very important that all traces of zinc dust welding primer be removed from visible exterior surfaces.

3.5.4 Wash all exterior surfaces of the body, except the previously treated and filled soldered areas, with solvents or cleaners to dissolve or loosen sealers, drawing compounds, grease, oil and ash which has accumulated on the body due to flaming and charring of body sealers in the welding operations. This is to facilitate removal of surface contaminants in the cleaning stage of the phosphating unit. The operator shall wear helmet, goggles and gloves.

NOTE — For all solvent-wipe operations use clean rags or sponges. Use of steel wool or wire brushes is permissible only in those localized areas where contaminants present difficulty in removal.

3.6 Phosphate Coating — All bodies shall be phosphate coated to meet the requirements. All underbody parts shall be previously cleaned and rust-proofed to meet the requirements. All doors and tailgates shall be kept ajar through the phosphate coating system to allow the solutions to wash the door jambs and door faces. Hoods and deck lids shall also be opened and so positioned, consistent with spray nozzle adjustment, that full coverage is obtained on their undersurfaces. Adequate drain holes on the floor board and luggage compartment shall be provided for effective solution drainage.

3.7 Body Blow-Off — Blow-off with compressed fan-propelled air to facilitate removal of chemical solutions and water. There shall be no areas exhibiting accumulation (puddling) or splashing as the body enters the dry-off oven. Remove by wiping, as required.

3.8 Body Dry-Off — Dry-off the body in a convection type oven. Recommended schedules are 6 to 10 minutes at ambient temperature of 150°C. The interior surfaces of the structural members shall be dry before proceeding to the dipping operation. The minimum metal temperature in the still area shall be 105°C for 3 minutes. Supplementary radiant heating may be employed to attain specified temperatures in heavy metal areas.

3.9 Removal of Residual Salts — Remove concentrated residual salts, resulting from accumulation of drippings into the body from the overhead body hangers, by wiping with cloth.

3.10 Primer — Dip priming of the car bodies is necessary to ensure adequate protection of underbody and other recessed areas, such as wheel arches and inside of doors which are subjected to severe corrosive conditions and are not accessible to spray application of primer. Following two types of dip primer as specified in **3.10.1** and **3.10.2** can be used :

- a) Solvent-borne composition, and
- b) Water-borne composition.

3.10.1 Reducing of Solvent-Borne Dip Primer — Solvent-borne dip primer shall be reduced with the recommended thinner. It is necessary that the volumetric reduction be controlled to maintain the desired viscosity and physical constants to obtain optimum build and flow.

3.10.2 Reducing of Water-Borne Dip Primer — Water-borne dip primer shall be reduced with demineralized water. It is necessary that the reduction is controlled to maintain the desired viscosity and physical constants to obtain optimum build and flow.

3.11 Immersion of Body in Dip Primer — The body shall be properly dipped to a specified level to cover all interior surfaces of box sections. Minimum dry film thickness of the dip primer shall be 15 microns on all box section areas.

3.12 Dip Primer Removal

3.12.1 Removal from Exterior Surfaces — It is necessary that the excess of dip primer on the edges of the exterior surfaces is removed by squeezing at the exit of the dip tank in all plants.

3.12.2 Removal from Interior Surfaces (Floor Pans) — Suitable drain holes should be provided on the floor pan and trunk compartment floor to effectively drain out excess paint and avoid accumulation.

3.13 Dip Primer Bake

3.13.1 Solvent-borne primer is not required to be baked separately. It can be flashed for 20 minutes and primer surfacer is applied. Both primer and primer surfacer are baked in a single operation.

3.13.2 Water-borne primer shall be separately baked before the application of subsequent coats of primer surfacer. The minimum stoving schedule recommended is 30 minutes at 150°C.

3.13.3 Underbody Primer — Where dip priming facilities do not exist it is necessary that the under-chassis, wheel arches and underbody areas shall be primed with a suitable primer by spray. Red primer surfacer can also be used for this purpose.

3.14 Body Clean-Up

3.14.1 Dry Dip Primer — Remove any dry dip primer which has splashed or drained on to the exterior body surfaces. This operation shall be accomplished by wiping with a 2.5 percent aqueous solution of ammonia or the recommended solvent blend.

3.14.2 Cements, Sealers, Oil or Other Contaminants — Wipe areas contaminated with cements, sealers, oil or other surface contaminants with naphtha.

3.14.3 Tack Off — Tack off all exterior body surfaces which shall be subsequently colour coated and the visible after final assembly. It is absolutely necessary that no residual tack-rag varnish be present on body surfaces. Also, tack off decorative integral interior surfaces.

NOTE — For all manual clean-up operations, production personnel shall wear helmet, goggles and clean PVC surgical gloves. For all solvent-wipe operations, use clean rags or sponges.

3.15 Filling of Metal Defects (Spray) — Apply by spray, red high-fill primer, or unreduced red primer, to those defective areas which are inaccessible to knife glazing and optionally to other areas requiring filling. Viscosity and film thickness shall be as required to effect complete filling.

3.16 Application of Primer on Underside of Cowl Top Panel Grille and Top Visible Surfaces — Apply by spray, utilizing an extension spray gun, rust inhibiting primer, to the underside of the cowl top panel grille and to the top visible surfaces. Two coats shall be applied, wet on wet, by spraying during insertion and withdrawal of the extension spray gun. Spray gun may be inserted through *both the left and right side* access holes. Minimum dry film thickness of primer on these parts, including lower edges, shall be 30 microns. This operation shall preferably be performed during the primer surfacer spray stage.

3.17 Spray Primer on Underside of Front and Rear Fender Assemblies

3.17.1 Spray red primer or grey primer to all uncoated underside surfaces of the front and rear fender assemblies and sheetmetal exposed to the wheelhouse. The minimum dry film thickness of the coating shall be 30 microns.

3.17.2 Spray primer on upper inside surfaces of rear quarter panels and on the uncoated panels inside of trunk compartments. Spray red primer (grey primer or black primer are optional materials) over the interior surfaces of the rear quarter panels and on the uncoated surfaces on the inside of the trunk compartment including deck lid underside. The minimum dry film thickness of coating shall be 30 microns. The areas between the deck lid inner and outer panels, which are visible at any angle in normal service, shall be adequately coated. For those areas which will be subsequently colour-coated, the minimum dry film thickness of the primer coating shall be 30 microns. For those areas which are not subsequently colour-coated, two applications of primer or primers is necessary. The minimum dry film thickness of the primer or primers shall be 40 microns. Priming is not required over those areas in the trunk compartment which have been previously sprayed with fluid deadener, unless those areas are visible after installation of trunk liners and rubber mats or carpets.

3.18 Spray Primer on the Inside of the Engine Compartment Area — Spray red primer (grey and black primers are optional materials) over all surfaces in the engine compartment including the underside of the hood. The minimum dry film thickness of coating shall be 30 microns. The areas between the hood inner and outer panels, which are visible at any angle in normal service, shall be adequately coated.

3.19 Spray Red Primer on Exterior of the Body — Apply by spray

red primer to all exterior surfaces of the body. Minimum dry film thickness of red primer shall be 20 microns.

3.20 Spray Primer on Interior of Body

3.20.1 Interior Decorative Integral Parts — Prime all integral interior parts designated for colour coating in the first enamel booth with grey primer. Examples of integral interior parts are as follows :

- a) door garnish mouldings,
- b) door upper inner frame,
- c) quarter panel lower and upper inner frame,
- d) quarter panel garnish moulding,
- e) A and B pillars,
- f) door and quarter panel trim retainer moulding,
- g) C and D pillars,
- h) quarter panel,
- j) quarter panel cover plate, and
- k) wheelhouse, etc.

3.20.1.1 Spray a smooth continuous film with minimum dry film thickness of 20 microns. Dependent on individual plant facilities and sequence of primer operations, this grey primer shall be applied immediately prior to that point in the primer booth where the integral part or parts are subjected to the greatest amount of overspray deposition from other priming operations. The purpose of this specific location is to absorb overspray into the wet primer film.

3.20.1.2 Sanding of the primer on these integral parts is not necessary provided good finished appearance is obtained. Good finished appearance, therefore, depends on plant facilities and ability to maintain dirt-free primer booth operations as well as effective location of the priming operations.

3.20.1.3 Removal of water reducible dip primer or solvent-borne dip primer from integral parts is not necessary provided good finished appearance can be demonstrated and continuously maintained. This would be contingent upon complete absence of foam and irregular drain patterns and, also, absence of the immersion line. On those integral parts, so coated with water reducible primer, it still remains mandatory to apply grey primer.

3.20.2 Interior Non-decorative Areas

3.20.2.1 Footwells — Spray the footwells with red primer, so as to obtain a minimum dry film thickness of 25 microns.

3.20.2.2 Surfaces above the immersion line — Spray the uncoated interior areas of the body above the immersion line, including the roof side rails and edges of the windshield and backlight openings, with red primer (black primer and grey primer are optional materials). Roof underside surfaces, not in direct contact with decorative soft trim, may be excluded.

3.21 Spray Body Primer on Inside Surface on Non-galvanized Steel Sills — Insert extension nozzle through front or rear opening of sill. Immediately trigger the spray gun and apply red primer, or optional material, as nozzle is inserted and guided to opposite end of sill. Continue to trigger the gun as the nozzle is pulled back so that a second coat of primer is applied, wet on wet.

3.22 Filling of Metal Defects (Spray) — To those defective areas which are inaccessible to knife glazing and to other areas (requiring filling) which have been previously primed spray with unreduced grey primer. Film thickness shall be as required to effect complete filling without producing sagging.

3.23 Spray Grey Primer on Exterior of Body

3.23.1 Spray the entire exterior of the body, edges of doors, door jambs, lock and hinge pillars, and front fenders to pillar supports with grey primer having 20 microns minimum dry film thickness. The total dry film thickness of both red and grey primers shall be 40 microns minimum prior to sanding.

3.23.2 On door jambs, grey coat alone is permissible at a minimum dry film thickness of 20 microns. Flash off for 15 minutes at room temperature.

3.24 Bake Primer on Body — The primed body shall be baked at a schedule of 150°C minimum metal temperature for 30 minutes to cure the primer surfacer. It shall be ensured that temperature much beyond 150°C is not sustained to avoid overbaking.

CAUTION — Do not exceed metal temperature beyond 165°C in any area.

3.25 Sound Deadener — After baking of the primer surfacer, sound deadener either solvent-based composition or water-based composition (solvent-based is preferred) shall be applied on the following areas :

- a) whole underbody including wheel arches,
- b) inside floor pan,
- c) trunk lid and floor,
- d) bonnet, and
- e) inside doors.

3.26 Wet-Sand Body (First Deck)

3.26.1 Wet-sand those body surfaces which are to be subsequently finish-painted with 320 grit or finer silicone carbide paper or comparable grit disc screen. Comparable grade aluminium oxide paper may optionally be used. This is to remove all dirt, sags, high glazed areas, orange peel and minor defects. Then finish wet sand and hand pick-up in order to obtain the smooth-guide coat. Machine sanding of any type is not permissible over any short radius body contour. On horizontal and contoured surfaces where in normal sanding operations the grey primer is sanded through to the red on a portion of the total area, the minimum film thickness shall be 18 microns after sanding. On those surfaces, such as body side surfaces, which

are only lightly sanded or surfaces in contact with decorative hardware the minimum film thickness shall be 35 microns after sanding. This film thickness is necessary in those areas to reduce corrosion which is associated with body side mouldings and bright hardware.

3.26.2 Integral Interior Parts — Decorative integral interior parts, dependent on plant conditions, may require sanding in order to produce an acceptable surface for colour in the first enamel booth.

3.26.3 Clean-up After Wet-Sanding

3.26.3.1 On those exterior decorative areas to be painted in the first colour booth, and on all decorative areas which shall not be re-sanded on the second wet-deck, remove all primer sanding residue. Loosen and remove by manual wiping, or with automatic equipment, prior to entering the rinse area. The amount and exactness of clean-up required after wet-sanding is considerably dependent upon the location and effectiveness of the rinse operation. The combined clean-up and rinse operations shall produce a sanded body that is completely free of all residual sanding sludge.

3.26.3.2 Rinse — Rinse body with water having a total hardness rating less than 110 ppm and a total dissolved solid content less than 130 ppm.

3.26.3.3 Blow-off and dry-off — It is necessary that all surfaces to be finished, as well as surfaces in the proximity of areas to be finished, shall be dry before colour application. This shall be accomplished by thorough blow-off utilizing compressed air or fan propelled air blow-off, either manually, automatically or a combination of both, as required, followed by drying in a convection oven.

CAUTION — There shall be no areas exhibiting water accumulation (puddling) or splashing as the body enters the dry-off oven. Remove by wiping, as required.

3.26.3.4 A dry-off schedule of 10 minutes at 150°C or equivalent ambient temperature is recommended. However, dependent on the extent and efficiency of the blow-off operations, shorter oven times are permissible provided the surface is dry.

3.27 Application of Glaze to Body — Inspect primed surfaces and apply specific glazing putty to visible defects as required. The putty application shall be bare minimum. Remove any excess glaze.

3.28 Detail Wet-Sand Defects (Before Enamel) — Wet spot sand any remaining defects, glazing putty, etc, using 360 grit or finer silicone carbide paper. Comparable grades of aluminium oxide paper may optionally be used. Apply water with sponge. Wipe off excess water and sanding sludge with clean sponge. Blow-off with air if required.

3.29 Solvent Wipe — Wipe all of the previously sanded areas and all areas to be coated in first enamel booth with clean rags or sponges saturated with an approved solvent. The rag shall be dipped in clean solvent and wrung

out before each body is wiped. It is necessary to remove excess scaler, finger prints, residual sanding sludge, or any other contaminants. The solvent used for this purpose shall be regularly changed.

NOTE — For all manual clean-up operations, production personnel shall wear clean cotton gloves.

3.30 Tack Off — Tack off all exterior body surfaces and all decorative, integral interior surfaces, designated for colour coating in the first enamel booth with tack rags to remove all dust and lint from these surfaces.

3.31 Repairing Sand-Through

3.31.1 Accidental minor sand-through and out-through areas shall be primed with flash primer. In order to minimize the dry time, lacquer thinner shall be used as the reducing solvent, application shall take place within the colour booth and shall be by touch-up gun in order to restrict over-spray. Dry thickness shall be minimum 15 microns to maximum 20 microns. A flash-off time of minimum 2 to 3 minutes is required before colour coat is applied over the areas.

NOTE — The primer may be applied (consistent with existing safety requirements) outside of the colour booth provided there is a minimum flash-dry time of 5 minutes before application of colour coat.

3.31.2 To panels which have undergone metal repair and/or exhibit extensive sand-through areas, apply by spray to a dry film thickness of 40 microns. Baking is mandatory in this application prior to sanding (if required) and colour coating.

3.31.3 For soldered areas which have been sanded-through to bare metal or require additional filling, apply by spray flash primer (baking required prior to colour coating). Dry film thickness of repair primer shall be 50 microns after sanding. A light coat of colour for identification purposes is permissible over repair primer prior to baking.

3.32 Solvent Reduction of Stoving Enamels — Only the thinner recommended by the supplier of enamel should be used as required to get the spraying viscosity.

3.33 Spray Colour Coat — First Enamel Booth

3.33.1 In those plants wherein specified body enamel thickness on exterior surfaces cannot be obtained within existing colour-booth facilities a supplementary build-up coat shall be applied at this stage. Spray a single coat of specified body colour on those areas where it has been demonstrated that the specified film thickness cannot be obtained by the normal sequence of spray operations in the second colour booth.

NOTE — Apply build-up coat of exterior body colour on exterior surfaces.

3.33.2 Spray Trunk and Engine Compartments — For those plants not doing colour coating the trunk and engine compartment in the prime booth, spray colour coat over the previously primed surfaces of the trunk compartment including the underside of the deck lid, the rear seat strainer, top and side

of the wheelhouse, hinge reinforcements and hood lock panel. Spray colour coat over the previously primed surfaces of the engine compartment, including the underside of the hood. The minimum dry film thickness of the colour coat shall be 20 microns.

NOTE — Both priming and colour coatings are necessary in the areas specified above with the following exceptions:

- a) Priming and/or colour coating is not required over those areas in the trunk compartment which have been previously sprayed with fluid deadener, unless those areas are visible after installation of trunk liners and rubber mats or carpets. For those areas (fluid deadener) which are visible, priming (to diminish bleeding) and colour coating is required.
- b) For those areas which are not coated with fluid deadener and which are not visible after installation of trunk liners and rubber mats or carpets, colour coating is not necessary. However, if colour coat is not used, then two applications of primer(s) are essential. The minimum dry film thickness of the primer(s) shall be 40 microns.

3.33.3 Spray Integral Interior Parts — On specified integral parts spray specified body colours. Spray door jambs, lock and hinge pillars, and front fender to pillar supports with specified body colour. The minimum dry film thickness of colour coat in these areas shall be 40 microns.

3.33.4 Overspray

3.33.4.1 Remove all overspray from all exterior body surfaces, such as the sweep accent area, designated for colour coating in the first enamel booth by solvent wiping.

3.33.4.2 On areas, such as the horizontal surfaces of the deck lid, the rear quarter panels, the hood and front fenders, where satisfactory removal of overspray cannot be accomplished by sanding on the second deck, one of the following procedures shall be followed:

- a) Remove all overspray by solvent wiping with rubber solvent.

Or

- b) Prior to application of colour coat in the luggage and engine compartments, spray all the affected areas with a light coat of lower body colour to absorb any overspray.

Or

- c) For those plants colour coating the luggage and engine compartments in the primer booth, elimination of upper body colour overspray onto lower body horizontal surfaces may be accomplished by utilizing non-permanent masks.

3.33.5 Spray Exterior Body Surfaces — All exterior body surfaces designated for final painting in the first enamel booth shall be sprayed with two coats of the specified colour. Allow 5 minutes minimum flash time between coats. The minimum dry film thickness shall be 50 microns.

3.33.6 Bake Colour Enamel on Body — The colour coat shall be cured in a convection oven. Infra-red lamps, gas-fired infra-red burners, calrod units

and all other devices for radiant heating are unacceptable except for pre-heating prior to entering the convection oven. Oven time of 30 minutes through the convection oven is highly recommended. Curtailment of oven time may prohibit future use of new improved paint materials.

CAUTION — Do not exceed metal temperature of 135°C in any area. In those areas where metal temperatures of 145 to 150°C are attained, do not sustain for more than 5 minutes.

3.33.7 Baking Temperature Control

3.33.7.1 In order to ensure that proper paint cure (both colour coat and primer) is consistently obtained, it is mandatory that the baking times and temperatures be adequately controlled. To accomplish this all baking ovens shall be checked at periodic intervals. Therefore, a fully thermocoupled body and additionally a recording thermometer (smoke chart) shall be run immediately subsequent to the following:

- a) At model start-up, as soon as an uninterrupted run can be made at full line speed;
- b) Complete oven cleaning (occurring approximately 3 times a year);
- c) Major line breakdowns involving damage to oven duct work; and
- d) Changes in production schedules.

3.33.7.2 In addition to the above, weekly checks of all baking ovens shall be made with the recording thermometer. The smoke chart obtained shall be compared to the chart which was produced at the time of the latest run of thermocoupled body.

3.33.7.3 Inspect and route to paint repair line (major defects) and repair.

3.34 Paint Repair Before Trim (High Bake) — Major defects, such as large dirt particles, orange peel overspray, pitting off colour, sand scratches, file and disc marks, sags, craters, etc, shall be reduced by wet-sanding with 360 grit or finer silicone carbide sandpaper. Comparable grades of aluminium oxide paper may optionally be used. The wet-sanding operation shall be undertaken to avoid cutting through the primer. To repair areas sanded through to bare metal, isolate repair panel or panels by masking off the area with masking paper and tape. Solvent wipe. Tack-off. Spray the entire panel or panels with two coats of the required enamel. Flash off for 3 minutes minimum before baking. For installation of plant (new) facilities or for modification of existing plant facilities, minimum flash time of 5 minutes is recommended, to plant schedule.

3.35 Paint Repair (Final Low Bake) — Laminated glass windshields are particularly susceptible to damage by excessive heating or thermal shock. Windshields of cars passing through paint repair ovens shall be protected by an asbestos shield or blanket. The windshields shall be checked periodically with a thermocouple to ensure that the glass temperature does not exceed 75°C (see Caution). Any laminated side windows should be lowered

into the body or otherwise protected. Bodies glazed with laminated safety glass parts shall be removed from paint ovens before stopping the line for lunch hours or other shutdowns.

CAUTION — Protect laminated glass in paint repair ovens.

3.36 Preparation of Priming

3.36.1 Wet sand with 360 grit or finer silicone carbide paper all defective areas in need of repair. Comparable grades of aluminium oxide paper may optionally be used. Apply water with sponge. Air off excess water and sanding sludge with clean sponge. Blow off with air if as required. Wipe all the previously sanded areas with clean rags or sponges saturated with approved solvent. Use of zinc stearate 'no lead' paper is not permissible. Mask off all adjacent panels.

3.36.2 *For Miscellaneous Priming* — Apply by spray, air-dry repair primer, to all sand-through and cut-through areas. The primer may be built up as required by successive spray applications. Air dry 10 to 15 minutes or force dry with infra-red lamps. If so desired, the primer may be baked in the low bake oven.

3.36.3 *For Heavy Repair of Total Priming* — For heavy repair, where high filling is required, spray low bake repair primer onto surfaces previously sanded. Reduction to spray viscosity, and film thickness applied, are to be as required to effect complete filling. This primer shall be baked in the low bake repair oven, according to the low bake enamel schedule, prior to application of repair enamel.

3.37 Preparation for Colour Coating

3.37.1 Wet sand all primed areas with 360 grit silicone carbide paper. Wet sand the entire panel preferably with 400 grit sand paper so that the entire surface, including all panel edges, has been abraded. Comparable grades of aluminium oxide paper may optionally be used. Adhesion of the repair enamels is dependent on this operation.

3.37.2 *Colour Coating* — The repair enamel shall be either :

- a) Special low-bake enamel, or nitrocellulose finish; or
- b) Acid catalyzed low-bake enamel. The approved acid catalyst is added to the high-bake super enamel in the ratio as recommended by individual suppliers of paint. However, only a few selected colours are satisfactory for acid catalyzed touch-up. The use of acid catalyst tends to give a wide colour difference of the touch-up area.

3.37.3 Reduce the enamel with an approved solvent as required. Spray two single coats of enamel over the repair panel to produce a minimum dry film thickness (of repair enamel) of 40 microns. Flash dry for 5 minutes before baking. Bake at a minimum schedule of 20 minutes at 80°C metal temperature. The following equivalent schedules are also satisfactory :

- a) 18 minutes at 88°C metal temperature, and

b) 15 minutes at 93°C metal temperature.

Under no conditions shall the baking temperature be below 80°C metal temperature.

3.38 Final Car Preparation — Stoving synthetic finishes shall not be burnished. Only polishing with a suitable liquid polish using a soft mop or cloth pad is recommended.

4. FINISHING

4.1 Recommended practices for finishing of passenger cars using stoving synthetic enamels, stoving primer surfacer followed by nitrocellulose lacquers and synthetic air drying primer followed by lacquer primer surfacer followed by the nitrocellulose lacquer are prescribed in Table 1 along with the materials being used at present and relevant specifications on the subject.

TABLE 1 PROCESS OF FINISHING OF PASSENGER CARS

PROCESS DETAIL (1)	MATERIAL (2)	SPECIFICATION/ REQUIREMENT (3)
a) Pretreatment		
1) As soon as sheet metal parts are pressed, a thin coat of rust-preventive oil shall be applied by brush, swab or dip. This application depends on whether the parts are used immediately or stored as stock. Extra precautions, for instance additional preventive oil, proper storage, etc, may be necessary during monsoon	Any suitable material having good rust inhibitive properties and capable of being removed by mineral turpentine may be used	This should satisfy the requirements of IS: 1153-1975*
2) Rust-preventive oil should be removed thoroughly from the areas to be spot welded with the help of mineral turpentine using a brush or swab. The surface to be spot welded shall be thoroughly cleaned and a suitable welding sealer or primer applied	Any suitable welding sealer or welding primer may be used	Specification to be drafted. At present proprietary materials are used. The primer shall prevent corrosion starting from the welded joints after spot welding and also the parts shall be capable of being spot welded after the application of the primer

*Specification for temporary corrosion preventive, fluid, hard film, solvent depositing (first revision).

(Continued)

TABLE 1 PROCESS OF FINISHING OF PASSENGER CARS — *Contd*

PROCESS DETAIL (1)	MATERIAL (2)	SPECIFICATION/ REQUIREMENT (3)
3) After body assembly, apply mineral turpentine with brush or swab to remove greases from both inside and outside of the body and inspect for presence of rust. Apply a suitable derusting composition with steel wool and remove the rust, if any, from both inside and outside and wipe with cotton rags and blow compressed air all over the body, inside and outside	Any suitable derusting composition based on phosphoric acid may be used	Specification for derusting composition to be drafted. At present proprietary materials are used. After application and wipe off, the body shall be completely free from rust and shall not show any stickiness
4) The body is then submitted to suitable 6- or 7-stage dip or spray zinc iron phosphate coating system comprising of degreasing, hot and cold water rinse, phosphating, cold water rinse and passivating to get improved corrosion resistance/paint bondage but where facilities for such a treatment do not exist, the body shall be properly degreased and subsequently treated with brush-cum-wipe off derusting chemicals	Suitable phosphating chemicals and passivating chemicals conforming to IS : 3618-1966* could be used (Class B or C). The composition of the materials shall be such that it gives a coating 1.5 to 3.0 g/m ² film thickness	The phosphating chemicals shall satisfy the requirements specified in IS : 3618-1966* (Class B or C)
b) PVC Primer		
1) Apply PVC primer on the rain water channel for good adhesion of PVC sealer applied at a later stage	A suitable PVC primer may be used	Specification to be drafted. At present proprietary PVC primers are used
2) Apply epoxy stopper putty on brazed joints	Two component epoxy stopper putty may be used	Specification to be drafted. This material shall make the brazed joints completely water-proof and shall give complete protection against corrosion
c) Primer or Primer Surfacers		
1) Whenever facilities are available, application of slipper dip primer is recommended for underbody dip application. This provides protection to otherwise inaccessible areas. When dip application is not possible it is essential that the under-	Any suitable slipper dip primer having excellent corrosion resistance and adhesion on the metal surface may be used. Either solvent-borne primer or water-borne	Specification to be drafted. At present proprietary materials are used. The slipper dip primer shall be such that it provides the surface complete

*Specification for phosphate treatment of iron and steel for protection against corrosion.

(Continued)

TABLE 1 PROCESS OF FINISHING OF PASSENGER CARS — *Contd*

PROCESS DETAIL (1)	MATERIAL (2)	SPECIFICATION/ REQUIREMENT (3)
body, etc, is sprayed with a suitable primer or red primer surfacer used for conventional spray	primer can be used. In the latter case a separate baking for 30 minutes at 150°C is essential	protection against corrosion
2) Roof panel, rain water channel and seams are then coated with PVC sealer	Any suitable PVC sealer may be used	Specification to be drafted. Only proprietary materials are used at present
3) The body is then sprayed with one coat of stoving red primer surfacer both inside and outside followed by a second coat of stoving grey primer surfacer on the outside only. The primer surfacer is thinned with the thinner recommended by the supplier to the recommended viscosity as to give a dry film thickness of 40 to 50 microns for 2 coats. Use of a red and grey combination is a convenient guide for the flattening operation. The manufacturer may use either red or grey only if he is able to control the film thickness	Suitable stoving primer surfacer having good adhesion, flexibility, corrosion resistance, sandability and lacquer and stoving enamel hold-out may be used	Conforming to IS : 6161-1971*

OR

4) One coat of synthetic airdrying primer is sprayed over the whole body at a viscosity of 30 seconds in IS Cup No. 4 to get a dry film thickness of 25 microns. This is allowed to airdry overnight and then lightly dry sanded. Three coats of nitrocellulose surfacer are sprayed with 15 minutes interval between coats. The surfacer is thinned to 18 to 20 seconds in IS Cup No. 4 with the recommended thinner. The nitrocellulose primer surfacer is allowed to airdry for 4 hours	Proprietary materials are used	Specification to be drafted
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*Specification for primer surfacer, stoving, for automobiles.

(Continued)

TABLE 1 PROCESS OF FINISHING OF PASSENGER CARS — *Contd*

PROCESS DETAIL (1)	MATERIAL (2)	SPECIFICATION/ REQUIREMENT (3)
5) Two coats of synthetic primer surfacer red or grey are sprayed over the whole body both inside and outside. A flash off time of 5 minutes is given between coats. The primer surfacer is thinned with recommended thinner to a viscosity of 20 seconds in IS Cup No. 4 to get a film thickness of 45 to 50 microns in two coats. After application, the primer surfacer may either be airdried for 16 hours or baked for 20 minutes at 120°C	Suitable proprietary materials are used at present	Specification to be drafted
d) Putty		
1) After baking the primer surfacer and cooling the body to room temperature, the soldered areas are filled with stopper mixed with suitable thinner and made to a thick paste	This may be either airdrying or stoving type of putty with good filling properties and sanding properties. This shall not shrink blister or crack on baking and shall have good adhesion on the primer surfacer. This shall be capable of being sanded without clogging the paper either in 4 h airdrying or after baking at 130°C for 30 minutes. Only very light application of putty shall be carried out. As these would be potential weak spot in the painting system	Conforming to IS : 7164-1973*
OR		
2) Nitrocellulose putty is lightly applied over nitrocellulose primer surfacer/synthetic primer surfacer wherever necessary and allowed to airdry for 4 hours	Proprietary materials are used	Specification to be drafted

*Specification for stopper.

(Continued)

TABLE 1 PROCESS OF FINISHING OF PASSENGER CARS — *Contd*

PROCESS DETAIL (1)	MATERIAL (2)	SPECIFICATION/ REQUIREMENT (3)
e) Sound Deadener		
The underbody and the inside of the door panels are applied with sound deadener	This may be either applied by brush or by spraying using special equipment for the purpose, and shall be free from excessive flow or sagging during application. The material shall be such that it provides an effective barrier against corrosion and seal against the ingress of water and dust	Specification to be drafted. Proprietary materials are used at present
f) Surfacers or Putty Flatting		
The primer surfacer is wet-sanded by hand or machine and then washed with water inside and outside and air is blown to remove water and dried at elevated temperature or with cloth. The body is then inspected. Portions where bare metal is exposed during sanding are touched up with nitro synthetic touch-up primer, air-dried and dry-scuffed with emery Paper No. 400. The whole body both inside and outside is then tack ragged so that there is no loose particle of dust or dirt on the car	This shall be a non-sanding fast-drying type of primer which when dried forms a non-absorbent smooth surface with good adhesion on bare metal and capable of protecting it against corrosion. This shall have good hold-out for lacquer and stoving enamels	do
g) Application of Finish		
1) Two coats of synthetic stoving enamel are sprayed with 5 minutes interval between the coats both inside and outside body to give a dry film thickness of 40 to 50 microns. After the second coat allow the enamel an air drying time of 5 to 8 minutes and then bake at 130°C for 30 minutes. Allow to cool for 15 minutes to push the car to assembly department	Enamel, synthetic, stoving	Conforming to IS : 6125-1971*

*Specification for enamel, synthetic, stoving for automobile.

(Continued)

TABLE 1 PROCESS OF FINISHING OF PASSENGER CARS — *Contd*

PROCESS DETAIL (1)	MATERIAL (2)	SPECIFICATION/ REQUIREMENT (3)
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OR

2) Nitrocellulose lacquer is thinned with the recommended thinner to a viscosity of 20 to 21 seconds in IS Cup No. 4. Three coats are sprayed both inside and outside with an interval of 15 minutes between the coats. After the third coat it could be either air-dried for 6 hours or could be force-dried at 70°C for 20 minutes after a flash off time of 20 minutes. After light sanding a final mist coat is applied at a viscosity of 13 to 14 seconds in IS Cup No. 4. This can be air-dried overnight or force-dried at 70°C for 20 minutes

Lacquer, cellulose, pigmented, finishing, glossy

Conforming to IS : 5691-1970*

3) The body shall be then burnished with cutting compound using mechanical buff and subsequently with liquid polish

Proprietary materials are used at present

Specification to be drafted

h) Inspection and Touch Up

1) After assembly, inspect the body for defects of the paint job. Wherever bare metal is visible, the area should be properly feather edged and nitrocellulose touch-up primer followed by nitrocellulose primer surfacer applied. After drying for 4 hours, it is wet flatted with water and waterproof emery paper No. 400 and wiped dry

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2) Nitrocellulose based touch-up finishes are then used for touch-up on these areas using the appropriate thinner recommended by the supplier. Two coats are to be sprayed with 5 minutes interval between the coats. After 5 minutes a mist coat of the recommended thinner shall be sprayed on the dry spray area to ensure proper merging of the coats. A flash off time of 10 to 15 minutes is

Proprietary materials are used at present. This product shall be such that it gives a glossy finish after brushing and polishing comparable to stoving enamel

Specification to be drafted

*Specification for lacquer, cellulose, pigmented, finishing, glossy.

(Continued)

TABLE 1 PROCESS OF FINISHING OF PASSENGER CARS — *Contd*

PROCESS DETAIL	MATERIAL	SPECIFICATION/ REQUIREMENT
(1)	(2)	(3)
allowed and then the touched portions are dried for 15 to 20 minutes with infra-red lamps		
i) Touch up of synthetic stoving enamel shall be done edge to edge, that is, if the damage is on the door panel the whole door panel shall be sprayed with the finish		
3) After cooling, touch-up areas are polished with suitable liquid polish by mechanical buffing with soft mop. This polishing operation is to be carried out to remove the dry spray and proper merging of the touched-up area	Automobile, polish, liquid	Conforming to IS : 7982-1976*

*Specification for automobile polish, liquid.

INDIAN STANDARDS

ON

AUTOMOBILE FINISHES

IS:

5667-1970 Thinner for cellulose nitrate based paints and lacquers

5691-1971 Lacquer, cellulose, pigmented, finishing, glossy

6125-1971 Enamel, synthetic, stoving, for automobiles

6126-1971 Nitrocellulose surfacer

6161-1971 Primer-surfacer, stoving, exterior, red and grey, for automobiles

7164-1973 Stopper

8098 (Part I)-1976 Code of practice for finishing of automobile bodies: Part I Finishing of passenger cars

7982-1976 Automobile polish, liquid